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another five thousand dollars), we would have a sufficient basis for practical work. If the result should be to increase by only one-tenth the beast-maintaining power of our wild lands, the effort would be worth many millions per annum to the nation. When we consider that the introduction of the species of *Poa* which receive the name of 'blue-grass' has manifolded the pasturage-value of the regions where it flourishes, it is evident that the project is worth consideration.

N. S. SHALER.

HISTORY OF THE APPLICATION OF THE ELECTRIC LIGHT TO LIGHTING THE COASTS OF FRANCE.¹

III.

As the electric installation at the Planier lighthouse is the newest and most complete, some further details of its arrangement will be of interest. The plan (Fig. 7) shows clearly the position of the two generators, and of the transmission-shafting which sets them in motion.

Both generators are placed upon the same masonry foundation, and their axes are in the same line. In order, however, that one may be ready to replace the other in case of accident, their shafts are keyed together; and they both turn, the one with an open, the other with a closed circuit. Between the two machines is a short column (shown in Figs. 9 and 10), which supports the guides for changing the belts from the loose to the fixed pulleys.

Each machine is divided into two circuits, shown by four terminals placed at the upper part of the frame, two at each end. The two

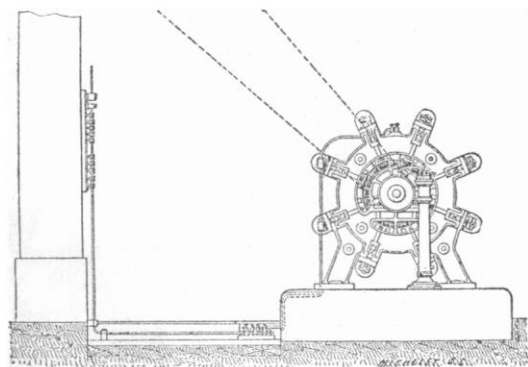


FIG. 9.

terminals placed beside each other at each end of the machine are those which at a given instant form poles of the same name. From

¹ Continued from No. 6.

each of them is led a copper conductor to the foot of the machine; thence, along the masonry foundation, it follows the ground (as shown in Figs. 9 and 10), and arrives at a commutator

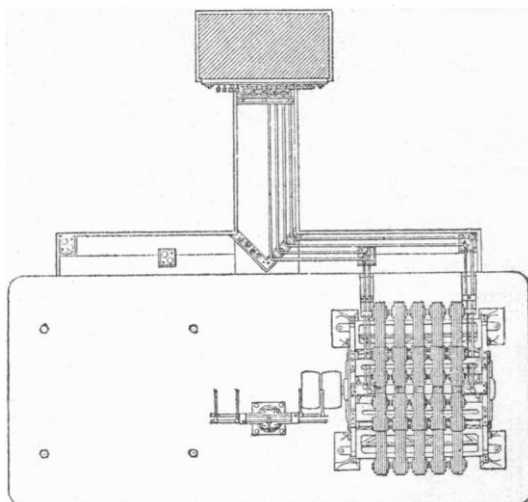


FIG. 10.

placed on the masonry column, which forms one support of the shafting. One object of the commutator is to take the current at will from either machine; another is to couple, either in tension or quantity, the two circuits of each machine. The four possible combinations of the commutator are shown in Fig. 11. An examination of this figure shows that the apparatus consists of fixed and movable contacts arranged in a circle. The first are fourteen in number. The four on the left are in relation with the terminals 1, 2, 3, 4, from which are led the conductors of the machine on the left, or machine No. 1. The four on the right are connected with the terminals corresponding with the conductors of machine No. 2. The three upper contact pieces are attached to the terminals communicating with the conductors of the lamp.

It should be said, that the current reaches the lamp by a large cable, then, after traversing the arc, is divided between two smaller cables, in one of which is placed the electro-magnet of the lamp. Of the three upper contacts, that of the left communicates with the terminal E, to which is connected the cable of the electro-magnet just mentioned; the next belongs to the terminal P C, of the second small cable; finally, the right contact, twice as large as the others, is in communication with terminal G C, of the large cable. This system of fixed contacts is completed below by three pieces,

the centre one having double the length of the others. The side-pieces communicate by means of terminal, rest the two movable contacts by which the current returns to the terminals 3 and 4.

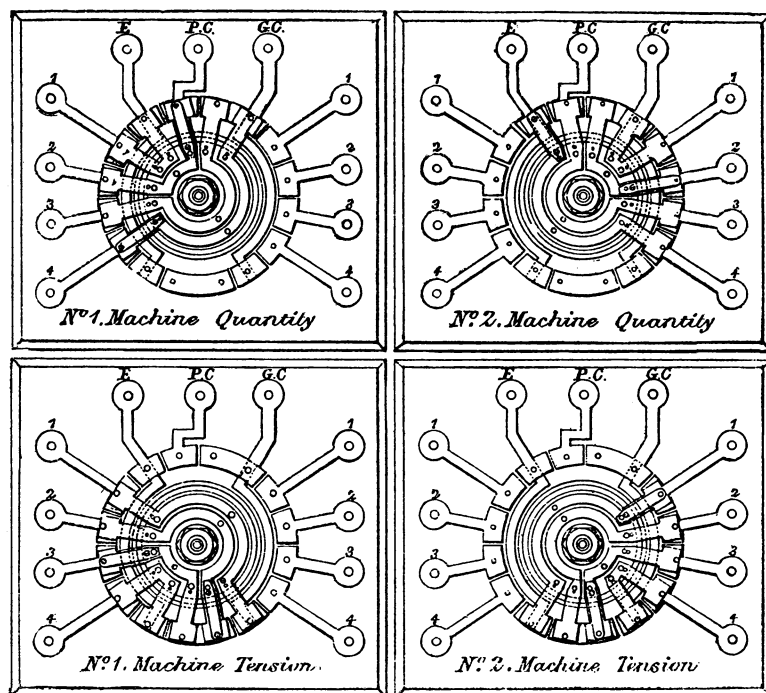


FIG. 11.

of auxiliary conductors, — that on the left with the contact piece of the terminal E, that on the right with the contact piece of the terminal G C.

The movable contacts, to the number of eight, are shown in the figure. They are all carried on one plate, free to move around the centre of the apparatus. The two innermost contacts are connected together so as to form a sort of U; the next pair forms a larger U; and the four others are connected, two and two, by circular strips. The different pairs of contacts are, of course, insulated from each other. A handle in the centre of the movable plate serves to place it in different positions.

Suppose, for example, that the movable contacts are in the first position shown in the figure for quantity. The terminals 1 and 2 being, at the same instant, poles of the same name, the current enters simultaneously by the two movable contacts corresponding to these terminals, and passes at the same time into the small cable and the cable in which is the electro-magnet. After passing the carbons, it is reunited in one conductor, and returns by the large cable to the terminal G C. On the fixed contact of double size, in connection with this

In coupling for tension in the same machine, the current, leaving the first circuit of the machine by the terminal 1, traverses the most open pair of movable contacts, and arrives at one of the lower fixed contacts by means of the conductor auxiliary to the contact G C. It then follows the large cable, passes through the carbons, and only traverses the small cable of the electro-magnet to arrive at the terminal E; thence, by the second auxiliary conductor, to the smallest pair of movable contacts and terminal 4. It then traverses the second circuit of the machine, and returns to the terminal 3. Afterwards, by the second pair of

movable contacts, it arrives at the large, lower, fixed contact, from which it is conducted by the

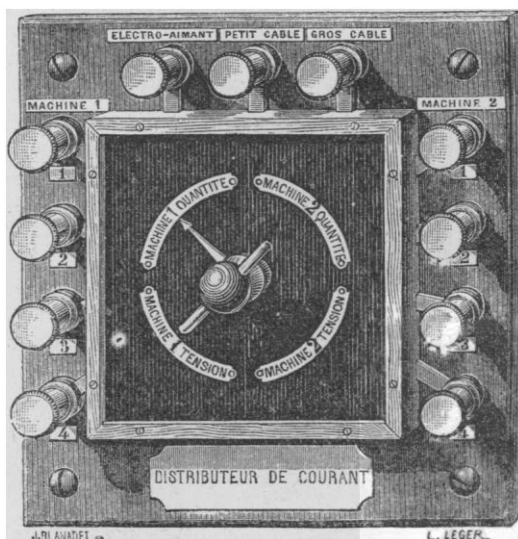


FIG. 12.

third pair of movable contacts to the terminal 2; that is to say, to the first circuit of the machine.

In examining the positions of the movable contacts shown for coupling machine No. 2 for tension or quantity, it will be seen that the direction of the currents is similar.

Fig. 12 gives a perspective view of this commutator. The contacts are covered with an ebonite plate, through which passes the handle for manipulating the movable plate. This ebonite plate bears four inscriptions, corresponding to the different combinations of the commutator; and an index moving with the handle indicates the combination in use.

This system has the advantage of changing instantly the grouping of the two circuits of the same machine, and of quickly substituting one machine for the other. It has, however, the drawback, common to all turning-contacts, of not being absolutely reliable.

THE HEAD-HUNTERS OF BORNEO.

In an octavo volume of three hundred and thirty-seven pages, Carl Bock describes his journeyings into the interior and across the island of Borneo and in the island of Sumatra. The trip across Borneo, of which the book mainly treats, was undertaken at the instance of the governor of the Dutch Indies, for the purpose of making a report upon the native races of the interior, and of gathering collections of the fauna.

The author describes well; and those who read for amusement and general information will not only find the book entertaining, but will derive an excellent idea of the chief features of Bornean scenery, of its strange animal life, of the character and peculiarities of the natives, and of many curious phases of human life under the exceptional conditions of this tropical island. Scattered through the first fifteen chapters, or what may be fitly termed the diary of the trip, are very many interesting facts and observations of value to the anthropologist. But the subsequent chapters more particularly interest him, being devoted to a consideration of the province of Koetoei, and of the Dyak tribes inhabiting it. The second part treats of a limited sojourn in Sumatra, and is by far the less important, as it is the smaller portion of the volume.

Borneo is stated to be inhabited by Malays, Boegis, a couple of hundred Chinamen, and a few Klings, and by Dyaks. The Malays are chiefly confined to the coast. The Boegis, emigrants from the south part of the Celebes, are settled in one district (Koetoei), 'where they are getting numerous and powerful.' The Dyaks, who are split up into numerous independent and hostile tribes, occupy the interior of the island.

Perhaps the most important contribution to anthropologic knowledge made by Mr. Bock, is his account of the Orang Poonans, or forest people, whom he believes to be the aboriginal inhabitants of Borneo, and who are not only distinct from the neighboring Dyaks, but, in their intercourse with them, do not appear to have adopted their habits. Meeting some of the Poonan men at Long Wai, a Dyak village, he succeeded in inducing one of the chiefs to escort him to his forest home, where, however, his observations were limited to a single afternoon. According to the picture presented by the author, the Poonans would seem to be in the lowest stage of savagery. He found them almost destitute of clothing, without pottery,

with few utensils (and of the simplest kind); and he confirms the belief, current in the island, that they build no dwellings properly so called, but live day and night in the open air, with no better shelter in showery weather than that afforded by an attap mat. It is possible that a longer and more intimate acquaintance with this wild people would have led to the discovery of tokens of a higher culture. The skin of the Poonans, particularly of the women, now seen by a European for the first time, is 'somewhat fairer than that of the other Dyaks,'—a result, as the author doubtless correctly surmises, of their residing in the dark forest.

A curious industry of the people is the collection of bezoar stones, which are used by the Chinese as a cure-all. The bezoar stones are of two kinds: one is derived from an external wound on a porcupine, and is supposed by the author to be composed of bits of leaves, etc., formed into a ball by the congealed blood; the other is said to be a gall-stone, found in different parts of the boehis monkey, *Semnopithecus cristatus*.

Head-hunting, as practised by all the Dyak tribes, is asserted to be, on what appears to be sufficient evidence, part and parcel of their religious rites. Birth and namings, marriages and burials, not to mention less important events, cannot be properly celebrated, unless the heads of a few enemies, more or less, have been secured to grace the festivities or solemnities. "Head-hunting," says the author, "is the keystone, so to speak, in the edifice of Dyak religion and character. Its perpetual practice is, no doubt, one great cause of the rapid extinction of the race."

Naturally enough, a practice so deep-rooted as this, has proved, and must continue to prove, the one great obstacle to be overcome in attempts to civilize the Dyaks.

While all the Dyaks are head-hunters, only one of the tribes, the Bahou tribe, practises cannibalism. Human flesh is eaten mainly at the feasts that follow a successful head-hunting expedition. The form of anthropophagy here disclosed seems to be somewhat analogous to that which obtained among the North-American Indians, not a few tribes of whom partook of the flesh of enemies, especially when the individuals slain were greatly renowned. At the same time, it is stated that these cannibal feasts are also given in celebration of various events, such as on the occasion of the death of a chief. Moreover, not only are the prisoners of war sacrificed, "but the richer members of the community give a number of slave-debtors (i.e., those who are sold into slavery to work out debts) to be put to death by slow torture, and eaten."

'Pomali' is a practice in vogue among the Dyaks, and also among other natives of the Malay archipelago, which seems to be somewhat allied in its nature to the tabu of the South-Sea Islander; although it appears to be less complex in its workings, and to cover much less ground, than that curious custom. As a sign that pomali is being resorted to, a bunch of maize is stuck in the ground, or baskets of rice are suspended from a bamboo post, when strangers are prohibited from entering the house or field thus pomalied.

Tattooing was found to be a common practice among the Dyaks, the women being the more elaborately ornamented. The method adopted by the professional tattooer is to first cut outlines of the intended pattern in wood, and then trace them on the body, when it is pricked in with a sharp-pointed piece of bamboo or a needle, dipped into a pigment prepared from vegetable dyes. Men are tattooed when they attain manhood, and women when about to be mar-